

Amendment & Response

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Applicant(s): Brian A. VAARTSTRA

Serial No. 10/032,049

Confirmation No.: 5131

Filed: 21 December 2001

For: METHODS FOR PLANARIZATION OF METAL-CONTAINING SURFACES USING HALOGENS AND
HALIDE SALTS

A1
cont.

supplying a planarization composition in proximity to the interface; and
planarizing the substrate surface;
wherein the planarization composition comprises a halogen-containing compound
and a halide salt, which are separately delivered.

A2

18. (AMENDED) A planarization method comprising:

providing a semiconductor substrate or substrate assembly including at least one
region of a platinum-containing surface;
providing a polishing surface;
providing a planarization composition at an interface between the at least one
region of platinum-containing surface and the polishing surface; and
planarizing the at least one region of platinum-containing surface;
wherein the planarization composition comprises a halogen-containing compound
and a halide salt, which are separately delivered.

A3

31. (AMENDED) A planarization method comprising:

positioning a metal-containing surface of a substrate to interface with a polishing
surface, wherein the metal-containing surface comprises a metal selected from the group
consisting of a Group VIII B metal, a Group IB metal, and a combination thereof;
supplying a planarization composition in proximity to the interface; and
planarizing the substrate surface;
wherein the planarization composition comprises:
a halogen-containing compound selected from the group consisting of F₂,
Cl₂, Br₂, I₂, ClBr, IBr, ICl, BrF, ClF, ClF₃, BrF₃, ClF₅, IF₅, IF₇, XeF₂, HgF₂, SF₆,
alkyl halides, and complexes of X₂ with organic bases, and combinations thereof;
and

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Q 3 a halide salt selected from the group consisting of NaI, KCl, KBr, NH₄F, Et₄NBr, Me₃NHCl, Me₄NF, and combinations thereof; wherein the halogen-containing compound and the halide salt are separately delivered.

34. (AMENDED) A planarization method comprising:

providing a semiconductor substrate or substrate assembly including at least one region of a platinum-containing surface;

providing a polishing surface;

providing a planarization composition at an interface between the at least one region of platinum-containing surface and the polishing surface; and

planarizing the at least one region of platinum-containing surface;

wherein the planarization composition comprises:

Q 4 a halogen-containing compound selected from the group consisting of F₂, Cl₂, Br₂, I₂, ClBr, IBr, ICl, BrF, ClF, ClF₃, BrF₃, ClF₅, IF₅, IF₇, XeF₂, HgF₂, SF₄, alkyl halides, and complexes of X₂ with organic bases, and combinations thereof; and

a halide salt selected from the group consisting of NaI, KCl, KBr, NH₄F, Et₄NBr, Me₃NHCl, Me₄NF, and combinations thereof;

wherein the halogen-containing compound and the halide salt are separately delivered.

37. (AMENDED) A planarization method for use in forming an interconnect, the method comprising:

Q 5 providing a semiconductor substrate or substrate assembly having a patterned dielectric layer formed thereon and a metal-containing layer formed over the patterned

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dielectric layer, wherein the metal-containing layer comprises a metal selected from the group consisting of a Group VIIIB metal, a Group IB metal, and a combination thereof;

positioning a first portion of a polishing surface for contact with the metal-containing layer;

providing a planarization composition in proximity to the contact between the polishing surface and the metal-containing layer; and

planarizing the metal-containing layer;

wherein the planarization composition comprises a halogen-containing compound and a halide salt, which are separately delivered.

50. (AMENDED) A planarization method for use in forming an interconnect, the method comprising:

providing a semiconductor substrate or substrate assembly having a patterned dielectric layer formed thereon and a metal-containing layer formed over the patterned dielectric layer, wherein the metal-containing layer comprises a metal selected from the group consisting of a Group VIIIB metal, a Group IB metal, and a combination thereof;

positioning a first portion of a polishing surface for contact with the metal-containing layer;

providing a planarization composition in proximity to the contact between the polishing surface and the metal-containing layer; and

planarizing the metal-containing layer;

wherein the planarization composition comprises:

a halogen-containing compound selected from the group consisting of F_2 , Cl_2 , Br_2 , I_2 , $ClBr$, IBr , ICl , BrF , ClF , ClF_3 , BrF_3 , ClF_5 , IF_5 , IF_7 , XeF_2 , HgF_2 , SF_4 , alkyl halides, and complexes of X_2 with organic bases, and combinations thereof; and

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Al 6
cont.
a halide salt selected from the group consisting of NaI, KCl,
KBr, NH₄F, Et₄NBr, Me₃NHCl, Me₄NF, and combinations thereof;

wherein the halogen-containing compound and the halide salt are separately
delivered.

51. (NEW) A planarization method comprising:

positioning a metal-containing surface of a substrate to interface with a polishing
surface, wherein the metal-containing surface comprises a metal selected from the group
consisting of a Group VIIIB metal, a Group IB metal, and a combination thereof;

supplying a planarization composition in proximity to the interface;

and

planarizing the substrate surface;

wherein the planarization composition comprises:

A 7
a halogen-containing compound selected from the group consisting of
ClBr, IBr, ICl, BrF, ClF, ClF₃, BrF₃, ClF₅, IF₅, IF₇, XeF₂, HgF₂, SF₄, alkyl halides,
and complexes of X₂ with organic bases, and combinations thereof; and

a halide salt selected from the group consisting of NaI, KCl,
KBr, NH₄F, Et₄NBr, Me₃NHCl, Me₄NF, and combinations thereof;

wherein the halogen-containing compound and the halide salt are separately
delivered.

52. (NEW) A planarization method comprising:

positioning a metal-containing surface of a substrate to interface with a polishing
surface, wherein the metal-containing surface comprises a metal selected from the group
consisting of a Group VIIIB metal, a Group IB metal, and a combination thereof;

supplying a planarization composition in proximity to the interface; and

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planarizing the substrate surface;

wherein the planarization composition comprises a halogen-containing compound and a halide salt, and further wherein the halogen of the halogen-containing compound is different than the halogen of the halide salt.

53. (NEW) A planarization method comprising:

Q7
Cont . positioning a metal-containing surface of a substrate to interface with a polishing surface, wherein the metal-containing surface comprises a metal selected from the group

consisting of a Group VIIIB metal, a Group IB metal, and a combination thereof;

supplying a planarization composition in proximity to the interface; and

planarizing the substrate surface;

wherein the planarization composition comprises a halogen-containing compound and a halide salt, and further wherein the planarization composition is not basic.
